



# **Installation Manual**

## **Kawasaki**

### **Vulcan/Nomad**

### **Version 2.1**

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# Introduction

This manual covers installation of the LegUp Landinggear system by Chopper Design Services. This system should only be installed by a qualified technician, or those with above average mechanical skills. If you are not SURE that you can perform this installation, please contact us and we will help you find a qualified shop to assist you.

If you have been looking for a system that will keep your feet on the pegs, this is NOT the system for you! On the other hand, if a system that will relieve you of the weight of the bike and help you avoid balance problems as you approach a stop, LegUp is what you need.

Improper installation will void your warranty, so please be very careful!

Thanks for choosing LegUp!

# Warranty

Chopper Design Services warrants the LegUp system for a period of one year from date of purchase. This warranty covers replacement parts and/or manufacturer defects. Incidental damages or costs are the responsibility of the purchaser.

Defective parts are to be returned to Chopper Design at the address below. Purchaser must contact Chopper Design to receive a Return Material Authorization, prior to returning defective parts to Chopper Design.

Abuse, improper installation or use, collisions or accidents, are not covered under this warranty. Replacement parts for this type of damage are available through Chopper Design.

Users of the LegUp system agree that Chopper Design is NOT responsible for personal injuries or damage to property arising from the use of the system. While we believe this system to be safe and reliable, the user is advised that use of LegUp is done so at the users' own risk. Use of the system implies agreement to the above statements. If you can't agree with the above, Chopper Design and its dealers would be happy to refund your full purchase price, before you use the LegUp System.

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# Installation Instructions

The LegUp® system has many components. Please be sure you have them all before starting your installation.

## COMPONENTS:

- 1) **Control Switch Box**
- 2) **Linear Actuator**
- 3) **On-board Computer Module**
- 4) **Proximity Sensor**
- 5) **Leg Support Stand**
- 6) **Leg/Wheel System**
- 7) **Hardware Bag**
- 8) **Actuator Bracket**

If you believe you are missing any parts, please contact Chopper Design at 407-834-5007, and we will rectify the situation.

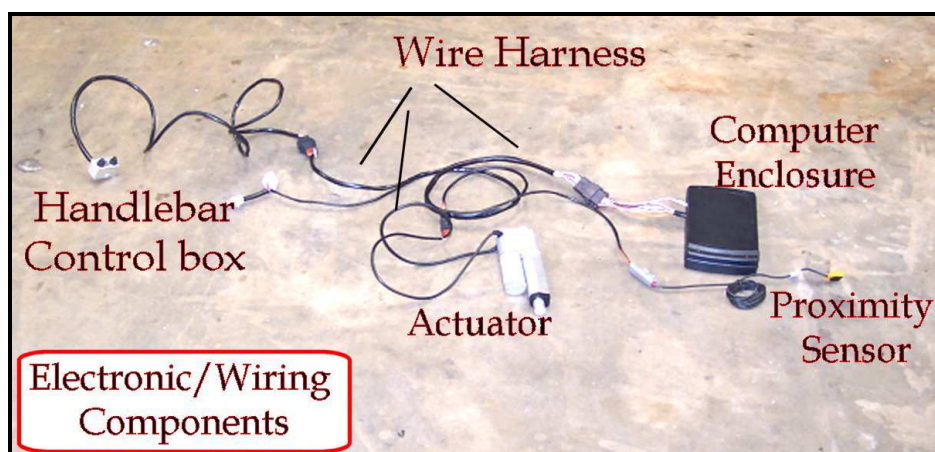


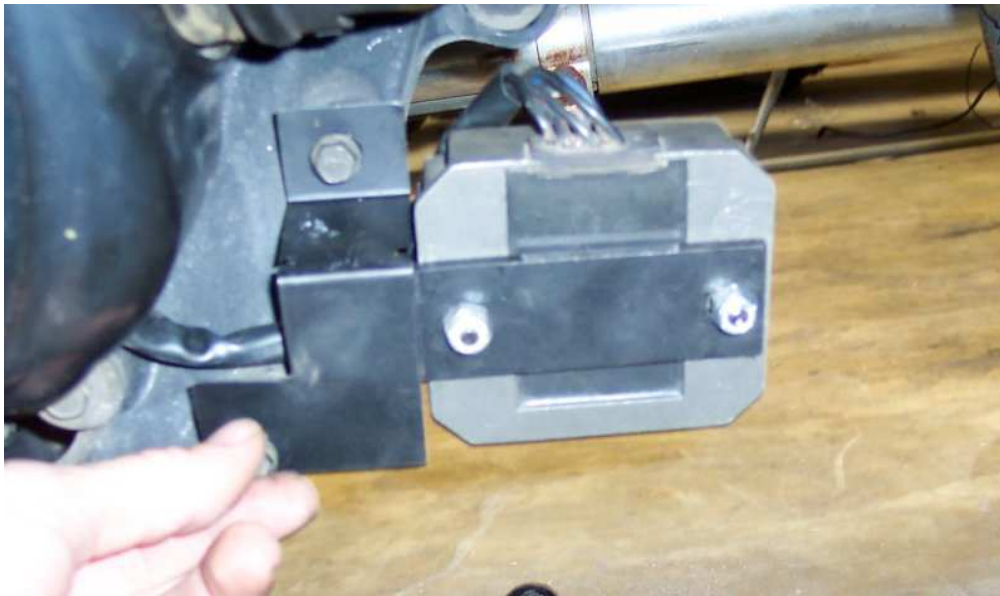
Figure 1

# PREPARE FOR INSTALLATION

Place the motorcycle on an acceptable bike lift. You will need to keep the bike on its wheels for most of the installation, and jack the rear wheel off the lift for some portion of the installation. Make SURE the motorcycle is secure on the lift!

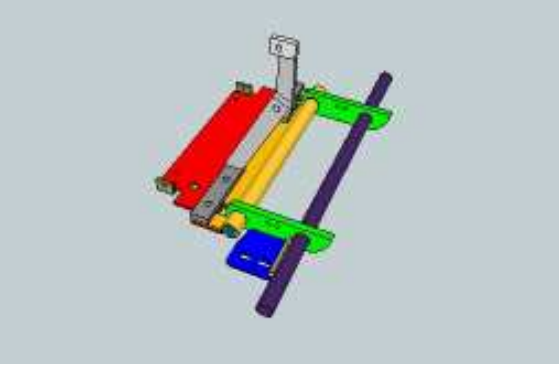
If you have a Vulcan, we need to remove the regulator before we install the LegUp system. The regulator on a Vulcan is mounted below the left passenger foot peg. It is held on to the bike by 2 bolts. Remove these bolts and unscrew the regulator from the chrome mount.

Now find our mount, screw the regulator to it as shown, and mount it to the motorcycle.



We are now ready to begin!

# INSTALL LEG SUPPORT STAND



LegUp has developed a new, stronger attachment system which attaches to the Kawasaki® via the casting holes under the frame. The leftmost hole is a bit further toward the rear of the bike than the right one. You will find there are rubber inserts in these holes with washers and a through bolt holding them to the bike. Remove these bolts and washers and keep the rubber inserts in place.

Find the left upright (3/8" material with 2 holes on the bottom, a slanted arm, with one hole on the top). Use one of the 5/16" X 2.25" Chrome Bolts, take 2 washers from the parts bag, put it on the bolt, run the bolt through the upright, then the rubber insert, and reinstall the nut. Just snug this nut and bolt for now. The other upright gets installed in a similar fashion except the square end with the single hole faces forward (this one is inside the Frame Casting).



When both are installed properly, from the left side of the bike, they should look like the picture below. Both uprights need to be able to pivot to meet the support plate that is installed later.



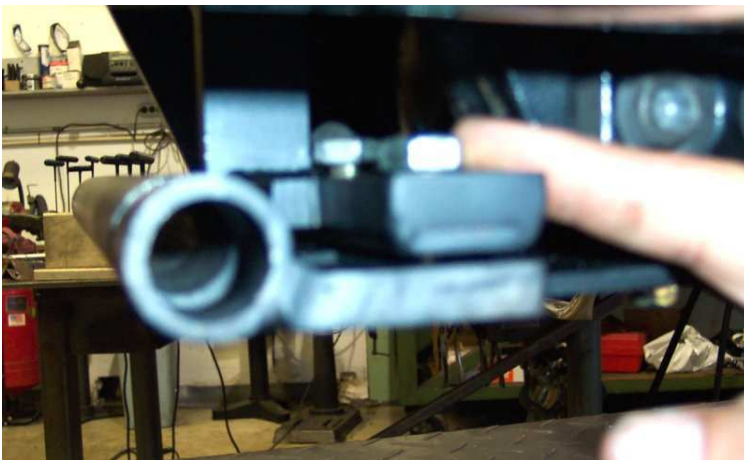
Next we want to find two small L-shaped brackets. They have bronze-colored bolts threaded through them already. The two brackets have their bolts pushed through the holes in the tabs on the bottom of the frame (see circle in picture at the left). At this time just push both bolts through these holes in the frame. Now we will introduce the support plate.

Now we have to change the oil filter! Put a pan under the oil filter (right side) and unscrew the oil filter. Replace this filter with the K&N filter provided. We use this because the installation of the system will not allow a normal filter wrench to reach the filter. The nut on the end of the filter (part # KN-303) WILL allow filter removal. Once accomplished, we can install the center plate. Make sure you check and top off your oil if needed!

Find the support plate (flat plate with tubing welded to back end). Remove any bolts that may have been pre-threaded for you and set them aside. With the tube toward the back and facing upward, line the plate up with one of the small forward brackets you just installed. Using one of the bolts just removed from the plate, start this through the bracket and into the threaded hole on the front of the plate (some blue Locktite is in order here!).



Do the same for the other side. **DO NOT** Tighten these bolts yet!



Now find the larger bolts, and start them in the 2 holes on the right side upright and just the inside one on the left side upright. Notice one bolt is longer than the other three; leave this one to the side for now. Gently start threading these bolts into the threaded holes in the support plate and leave them loose (again a bit of Locktite here). Leave the Bolts as they are until we install the Actuator Bracket.

Now we can mount the actuator bracket.

# ACTUATOR BRACKET

The actuator bracket mounts to the vehicle between the plate we just installed, and the left rear floorboard/foot-peg mount. Remove the left rear floorboard (Voyager) or peg mount (Vulcan).



On Voyagers, you can line up the upper holes; on the Vulcan, find the 3/8" spacer provided, and line this up as well. Using the longer chrome bolts provided and some blue Locktite, start these bolts through the floorboard / foot-peg then through the holes on the actuator bracket (and spacer if there) and into the frame... Leave these loose for now!

Remember that longer bolt left over from the plate installation? That is

installed through the bottom hole on the actuator mount, into the outer hole on the support plate.

Once these bolts are in place, tighten the lower bolt first then the floorboard (or Foot Peg Mount) bolts.

Now we need to tighten the upright bolts that attach to the bike. Next the three other bolts attached to the back of the plate, then the front bolts.



Now let's mount the Leg/Wheel Assembly!

# LEG/WHEEL ASSEMBLY



With help from an assistant, slide the Leg/Wheel Assembly around the rear tire (careful of the finish!), and align the Leg Mounting Points (they have the bronze bushings in them) with the slots in the Support Stand. If available a very small amount of 'Never Seize' on the shaft is in order here. Then start the stainless steel shaft in from one side through the tube on the support stand, and through the first leg mounting point and its bushing. The fit is tight, so take your time. Carefully work the shaft through the tube and the second leg mounting

point. The shaft is inserted properly when it is inserted just past (approximately 1/8") the end of the tube. This distance should be about the same on both sides, but it is not critical as long as both sides are inside the tube. If you need to, you can tap lightly on the shaft (brass drift is preferred here). Once the shaft is in place, use a small amount of blue thread locker and install the (2) chrome bolts and washers on the end of the shaft to finish it off.



Make sure the legs move up and down without any binding!

# MOUNT ACTUATOR

We can now mount the actuator to the Actuator Bracket we installed a few minutes ago. The round shaft faces down with the shorter cylinder facing forward as you can see at right. The axles for the aluminum brackets should be installed. Remove them and use one to mount the actuator at the top.

You can let the actuator dangle, and don't worry about the wire or the plug at this point. Tighten the nylock!



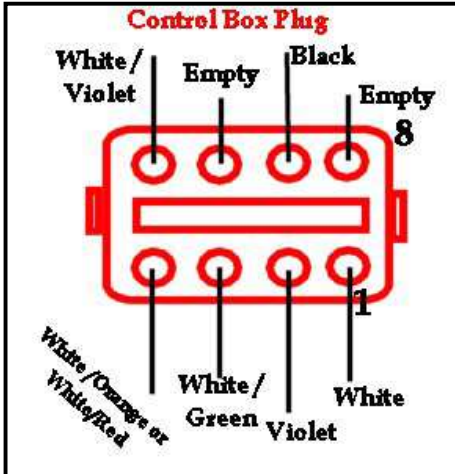
Next remove the axle from the lower actuator bracket (the silver piece on the left side of the left leg). Gently raise the legs and align the bottom hole of the actuator with the hole in the lower actuator mount, and reinstall the axle. No Locktite yet, as we may have adjustments! (Don't forget to remove and Locktite this later!)

**NOTE: *If the actuator is too short to reach the other mount you may have to lengthen it using the system. Temporarily plug the wiring harness into the bike, attach the power/ground leads (as described on page 16), and follow the directions for 'Maintenance Mode' in the 'Initial System Test' section below. Using what would be the left button on the switch box, just add a small amount of length to the actuator so you can align the mounts, then turn the bike back off.***

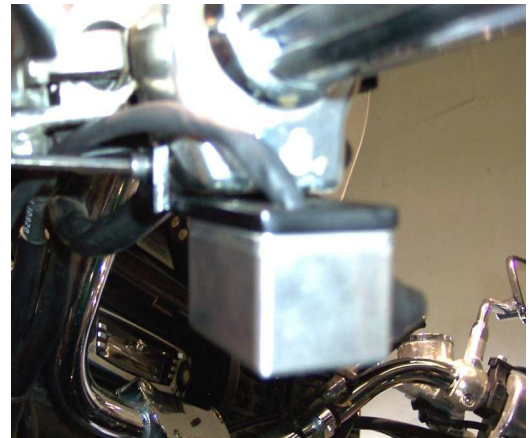
At this point you need to make sure that the mounts are in alignment and the actuator is not in any sort of bind! Check from behind the bike to make sure the actuator looks like it is in a straight line. It should have slipped into its' lower bracket easily, without having to bend the actuator one way or the other. If it did, Great! If not, you may have to adjust the top or bottom actuator bracket to get everything into alignment. Whatever you have to do to make sure the actuator is in a straight line now is the time to do it! On to the Control Switch Box!

# CONTROL SWITCH BOX

The switch box should already be mounted to a black mounting plate. The switch box mounts under the left grip and attaches to the left switch housing by a single bolt. Remove the bolt from the back of the left switch housing using a Phillips screwdriver.



Using the bolt provided, slip the bolt through the black plate, and then thread it into the switch housing. This bolt needs to be snug as when the buttons are pressed, we don't want the housing to pivot on the bolt (picture right). Square the box before tightening the bolt. Route the wire down the handlebar and route it through the center hole on the top tree.



Use wire ties to hold the wire to the bar.

At this point we need to route the wires from the switchbox under the tank to the area below the seat (see picture left, below).

You can remove the wires from the plug on the end of the switch box wire ([Instructions on these plugs can be found at http://www.whelen.com/install/131/13137.pdf](http://www.whelen.com/install/131/13137.pdf)), and tape the silver plugs together. This makes it easier, but you can try it either way. Once this works out, carefully remove the tape to expose the silver pins.



Check the pins to make sure none were damaged during the process. Make sure the wires under the fork have enough room to allow the bars to be turned and that they don't get caught on anything.

The next step is to reassemble the plug. Use the diagram at the start of this section for this.

Be very careful to make sure the wire colors all match

those in the mating plug and the diagram.

Now onto the rest of the wiring harness!

# WIRING HARNESS

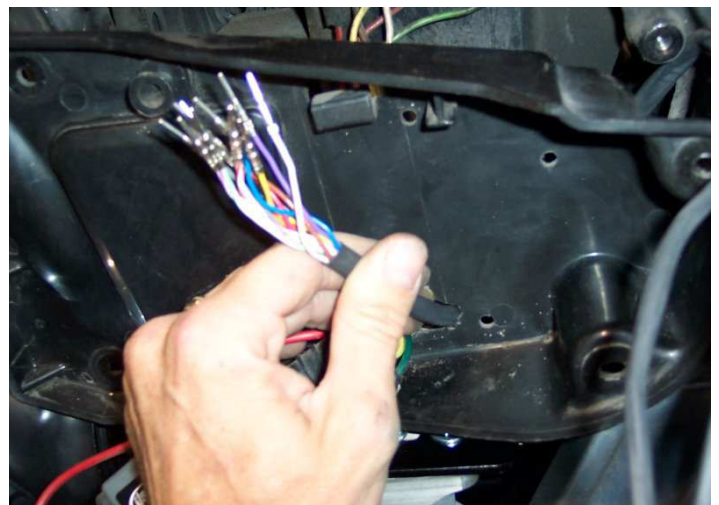
***NOTE: If you have a LITE System, Please refer to the addendum at the end of this manual, for differences between a Regular and LITE Harness!***

The next step is to route the wiring harness. The harness and the plugs are routed mostly under the seat and left side cover. The most difficult task is taking apart the 12 pin plug on the harness and feeding it into the left side box. (**Instructions on these plugs can be found at <http://www.whelen.com/install/131/13137.pdf>**)

Remove the left side cover, remove the (4) screws that hold it to the bike, and drill a small (3/8" or so) hole to allow the wire from the harness to get into the box.

Lay the entire harness under the seat area, and run the wire down to meet the side box, and through the whole you just drilled (picture at right). **DO NOT REINSTALL BOX YET!**

Carefully reassemble the plug (diagram at end of manual).



**It can't be stressed enough that these wires have to be perfect!**

Find the spot in the box cover that you wish to mount the computer to, and using the provided Velcro, attach the computer to the box cover (see below with plugs attached). The box will be reinstalled once we get the actuator plug and wire run up behind it, in the next step.



You need not worry about heat from the computer or anything like that.

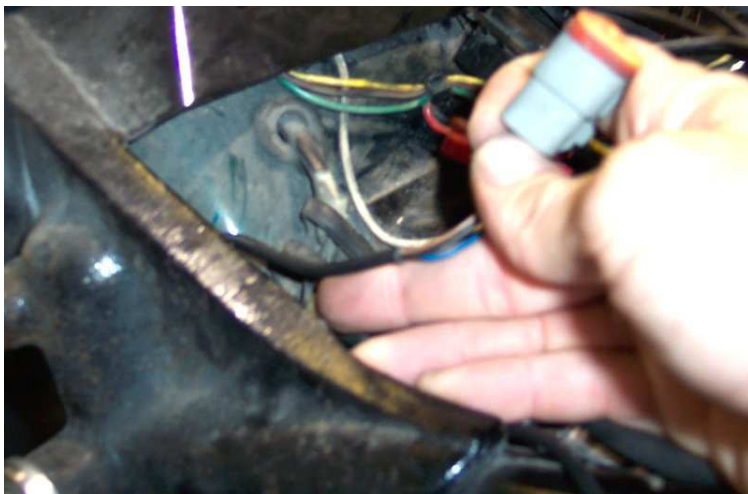
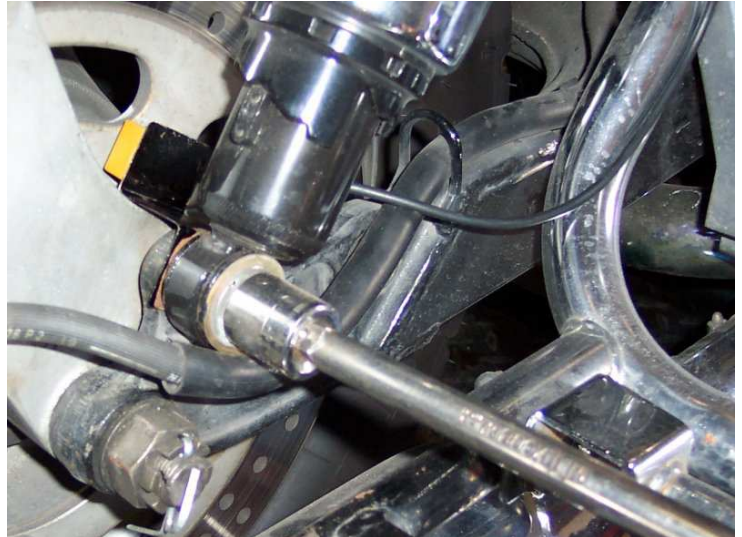
Now that the computer is attached, we want to run the wire from the actuator up to the seat area. Once you route this in the area that the side box covers, you can reinstall the side box and lock the cover on.

Make sure both the wires (the one from the actuator and the one from the

computer) are clear of everything. Use wire ties to make sure the wires stay where you put them (Neatness counts here!).

Next we need to find the proximity sensor and its bracket. The bracket will be mounted on the bottom bolt of the right shock absorber; don't mount it yet! We need to run and loosely tie off this wire behind the right frame member and up to the under seat area. The picture below, right, shows how the Proximity sensor will be installed. Don't install it yet, this is just to show you where the wire needs to be.

The next picture shows you where we want the wire to end up. You will need to push the plug up from behind and under the seat area, and tie it up against the vertical frame rail. The rest of the wire will be tied (loosely for now!) along the brake line (seen here to the right), once the Proximity bracket gets permanently mounted.



Pull any extra slack up into the seat area, but don't tie anything off quite yet!

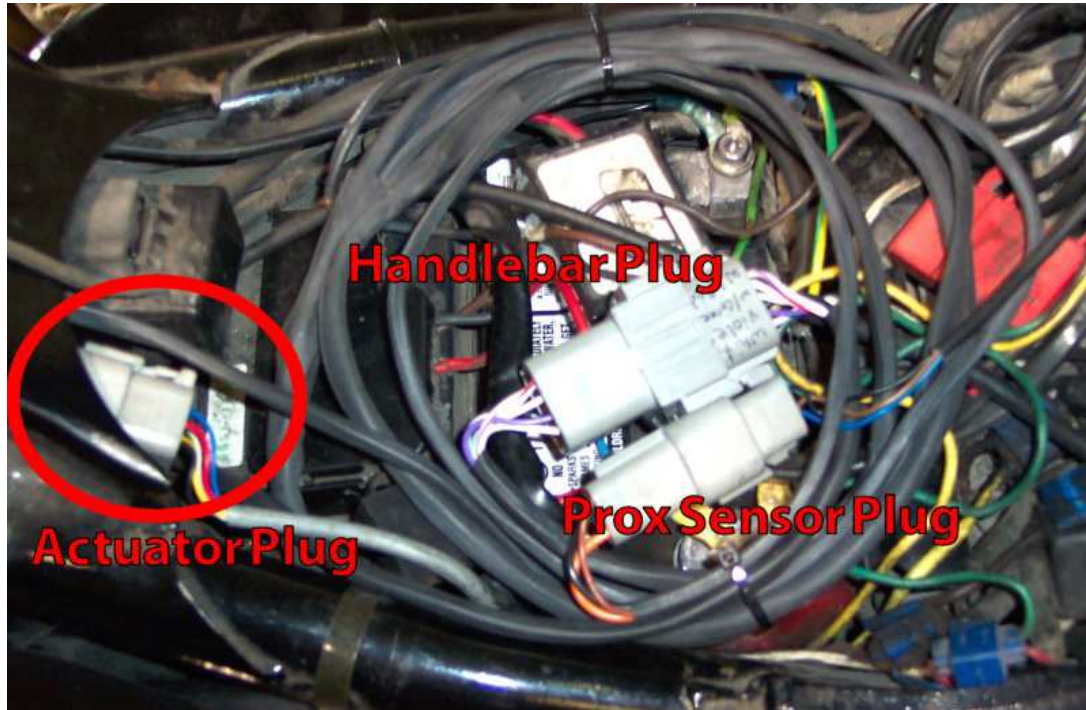
We should now have the six pin plug, the three pin plug and the twelve pin plug, along with the loose orange wire and the black wire with the hoop connector in the seat area.

This would be a good time to connect the mating plugs and start deciding where to place them to clear the seat when it is

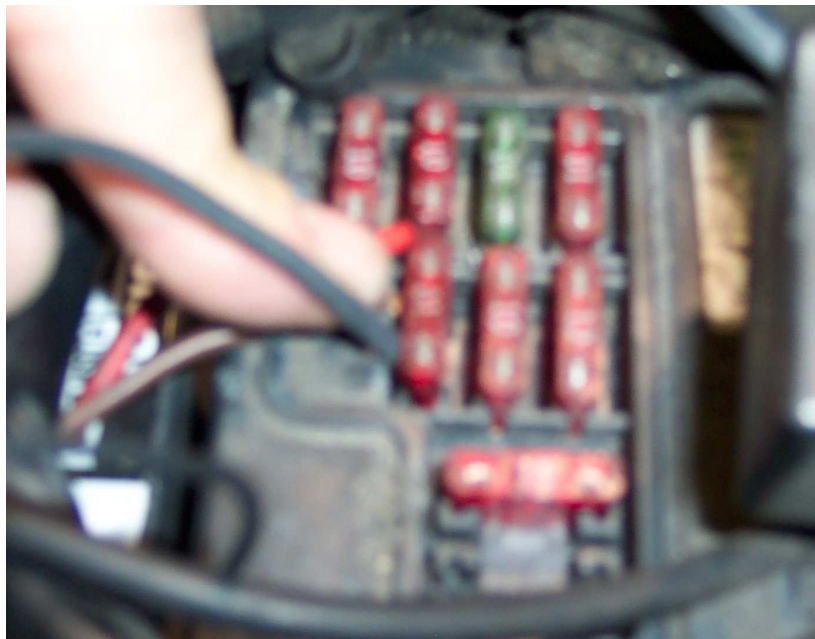
reinstalled.

Now we have to connect to the 12V power on the bike. The loose orange wire gets connected to a power source that only turns on when the key is on. We choose to slide this into the fuse box. We removed the Horn fuse, and slid the wire on the right side connector in the box, and reinstalled the fuse (a bit of a tight fit but it works and it protects everything). We also used a 15Amp fuse where the 10Amp was before. You can get your power anyway you like; just make sure it doesn't overtax any circuit, or come on and off with the blinkers (we made this mistake). Next remove the bolt from the negative side of the battery, put it through our hoop connector first, then through any other connectors that were on the negative post before.

At this point you should have an idea of how you want to lay out the wires. See the pictures (some blurry, sorry) on the next page for some details, and what the finished under seat area should look like.



**Under Seat Wiring Layout**



**Fuse Box Wiring**

# INITIAL SYSTEM TEST

***NOTE: If you have a LITE System, Please refer to the addendum at the end of this manual, for differences between a Regular and LITE system. Skip this section if you have a LITE System.***

Turn your bike on with the key switch. The dash should light up. At this point, have a look at the yellow proximity sensor. The **RED LED** (ON The Sensor) ***Should Not Be Lit***. Take a metal object (screwdriver, wrench, etc) and hold it on the flat face of the sensor (it has a circle embossed in it). The LED should light up, and go out when you move the metal away. If not, check all your connections.

Next, press the rightmost pushbutton and hold it for at least 3 seconds. One or both LEDs on the switch panel should light up; we really don't care which at this point. If this occurs, you are doing well. If both LEDs are flashing (maintenance mode) you can skip the next step which is to press and hold both buttons until both LEDs flash.

Next press both buttons for just an instant! If everything is working, the bottom or yellow LED on the switch box should flash, and the top LED should be out. The next step, and be careful here, is to touch the left button for a split second. The legs should move down just a bit. Touch the right button, and they should move up. With the bike on the lift, ***you have to be very careful here!***

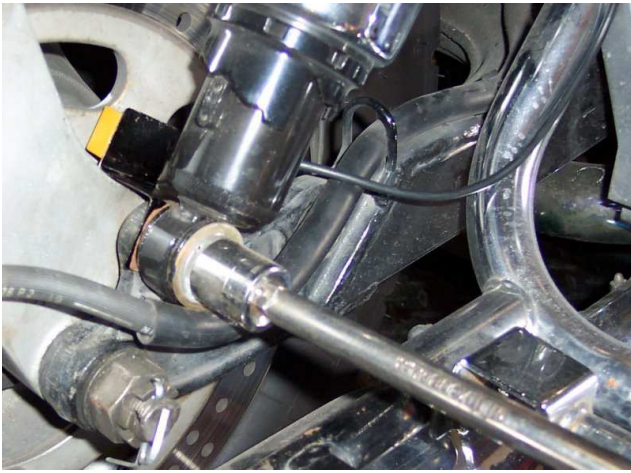
If all of the above has occurred, raise the legs. Press and hold the right button until the legs come up all the way, and turn the ignition switch off!

The test is now complete. Let's move on to mounting the Proximity Sensor.

# MOUNT PROXIMITY SENSOR

**NOTE:** *If you have a LITE System, Please refer to the addendum at the end of this manual, for differences between a Regular and LITE system. Skip this section if you have a LITE System.*

**This step is crucial!!** Understand it before starting. The proximity sensor tells the system how fast the bike is traveling. The proximity sensor mounts to the bottom bolt of the right rear shock absorber, and measures speed by watching how fast the rotor bolts go around.. You need to jack up the back wheel so we can spin it to test the sensor and its placement. Make sure the bike is in neutral.



The sensor will track the rotor bolts on the rear wheel as it spins, and is to be mounted 5MM away from the bolts or closer. Look at the picture at the left.

Remove the nut from the bottom of the right shock and loosen the nut on the top. Pull the bottom of the shock off the stud (the bike should be supported by a jack), slide the Proximity bracket over the stud, and reinstall the shock. Don't tighten the nut completely yet!

Once the bracket is mounted, turn the key on, spin the wheel, and watch the behavior of the sensor as the bolts pass it.

The LED on the sensor should be off when no bolt is passing the sensor, and the LED should light when a bolt passes by the sensor. Play with this by rotating the wheel back and forth while adjusting the bracket in, out, left or right until the light blinks consistently. Turn off the ignition.

Once you feel you have the right place, tighten the nut on the top & bottom of the shock down and slowly rotate the wheel. Every time a bolt passes, the light should get bright when the bolt is nearby and off after it passes.

Once satisfied with the mount, make sure the wire runs along the brake line, clean up and tighten the ties installed earlier, pull the excess wire up under the seat and make sure the wire is clear of everything from one end to the other.

# FINISHING UP

**CHECK ALL WIRES!** Now it is time to make sure all the wires are clear of everything and neatly tied off. You don't want a wire to get scuffed and damaged. Make sure there is no tension and any wires in the harness, and it looks something like the picture on page 15.

This would be a great time to double check all the bolts for tightness and to reinstall the seat (make sure all the wires are clear!)

Once you are comfortable that everything is correct, get the bike off the lift so you can dial in the actuator, and adjust the wheels.

## ACTUATOR ADJUSTMENT (Maintenance Mode)

***NOTE: If you have a LITE System, Please refer to the addendum at the end of this manual, for differences between a Regular and LITE system. Skip this section if you have a LITE System.***

Once you have the bike on the ground, turn the ignition to the accessory position and start the LegUp System (hold right button for 3 seconds). The system should enter maintenance mode automatically (Both LEDs Flash), but if it does not, enter maintenance mode manually (Both buttons for 3 seconds). With a helper nearby, straddle the bike, and hold it level. Hit both buttons for an instant to get the system in the "DOWN" setting mode (yellow LED flashing). Straddle the bike so your weight is NOT on the seat, hit and hold the left button until the wheels contact the ground and stop. Make sure that the suspension raises a bit as you do this. If not, the legs are not going down far enough, the bottom actuator mount may need to be moved left or right a bit to get the wheels all the way down (Contact LegUp for assistance if you need help with this). Once these wheels are down as described above, try to put both feet on the floorboards. The bike should be reasonably stable and you should be able to lean a bit in both directions without the bike falling over. The DOWN stop is now set!

Hit both buttons for a moment to get into the "UP" stop mode (top LED blinking). Carefully use the right button to raise the legs. Have your helper let you know as you approach anything that may come in contact with the wheels or the legs. You also need to make sure the system clears pipes, clamps etc. If you can't make the clearance to allow the legs to come up all the way, you can set the up stop just below whatever is interfering (if not, you will likely set up a permanent rattle!) Hit both buttons when complete, and you will be done with these adjustment.

Now press the left button and the legs should lower. Hit it again and the legs should retract. If you are satisfied with these limits, you have successfully installed the LegUp System. Time for a test ride!

# TEST RIDE

***NOTE: If you have a LITE System, Please refer to the addendum at the end of this manual, for differences between a Regular and LITE system. Deployment and Retraction of the wheels is COMPLETELY MANUAL if you have a LITE System.***

Get the bike to a clear paved mostly level area where you can test ride it. Start the bike, turn on the LegUp system and lower the legs. The first test should be done in a straight line. Put the bike in gear and slowly accelerate. You may notice that the bike tends to want to steer a small amount left or right. This is normal unless it is severe. Once underway, the top LED should flash at around 6 MPH, meaning the legs are retracting. You can lean on one wheel or the other as you leave to reduce any darting the system may be giving you.

Assuming the legs are retracted, you should try to deploy the wheels. As you come to a stop, the Green LED should be on. As you slow down (**almost stopped**), the Yellow LED should illuminate at the proper speed. Once it does (sometimes hard to see), hit the left button and put your feet down near the ground. The top LED should flash and you should soon feel the wheels deploying underneath you! Make sure you are ready to balance the bike! Uneven ground or lack of familiarity could make the bike want to lean one way or the other. With your feet ready to balance the bike, this should be no big deal. The slower you are going when deploying the wheels, the smoother the transition will be from wheels up to wheels down. Practice these maneuvers until you are comfortable with the wheel adjustments and the system operation.

***SEMI-AUTOMATIC DEPLOYMENT:*** Another way to deploy the legs is to hit the left button while you are running at any speed over 10MPH with the wheels up. The bottom or yellow LED should start to flash. When you slow down to around 8MPH the wheels will start to deploy (see the red/green flash on top LED). Again prepare to put your feet down.

***NOTE: The bottom LED Should not be LIT if the legs are up over 10MPH! In the event it is, the wheels will deploy instantly if you try to set them as above; this is dangerous! You MUST re-visit the sections on testing the proximity sensor. You should always be aware that this light should NOT be on if you are traveling at speed, and 'Arming' the system for deployment should only be attempted if the lower LED is Not Lit! Please see the User Manual for more information on Proximity Sensor Failure!***

The next thing to try is to make a turn right after a dead stop with the wheels down. As soon as you start the bike moving, try a left or right turn immediately by leaning into that turn. You may find that you have to nudge the bike a little bit more than usual to get the bike to lean, and you won't be able to lean as far as you can with the wheels up. Once into the turn, accelerating will raise the wheels. You will hardly notice the wheels coming up unless you see the top LED blinking!

The next thing to try is slow speed maneuvering with the wheels lowered. In a straight line on level ground, you should be able to keep your feet on the floorboards and move the bike forward at very slow speeds (simulate stop and go traffic). I like keeping my feet near the ground during these maneuvers! You can also try small 'Trike' turns; keeping the bike upright at slow speed and making turns as you would in a parking lot. Be aware that if you get over the speed that the legs come up, they will!!! Another thing I like to do is donuts. Start out slow, lean the bike left or right, and make circles at very slow speeds (throttle on, rear brake on, clutch slipping... you know like the cops do!). This helps you get familiar with the wheels being on the springs and allowing a lean angle!

Practice, practice, practice!! Enjoy your LegUp System!

# LEGUP LITE - ADDENDUM

If you have a Lite System, there are a few differences in the wiring compared to our Regular system.

The plugs and their locations don't change at all! Instead of plugging in the computer to the twelve pin plug, the Relay-Pack gets plugged into this plug. The Relay-Pack will be attached with Velcro as the computer would have been in the same location.

On the LITE system there is no proximity sensor, so ignore the testing and mounting of this sensor, and realize that the three pin plug will be left without a mating connector. We keep this plug in the wiring harness in case you upgrade to a regular system in the future.

## Using Your Lite System:

Unlike our Regular System, you don't turn the **LITE** system on, or adjust the legs as described in the '**Maintenance Mode**' section of the manual. When you turn your bike on, the LITE system is ready to go! Press and hold the left button to lower the wheels, press and hold the right button to raise them. No lights will flash; it is up to you to control the system manually!

**Please use EXTREME Caution when using the LITE System! Keeping the wheels lowered at speeds over 9MPH can be dangerous. Since the system is manual, please don't allow its' operation to distract you from controlling the vehicle!**

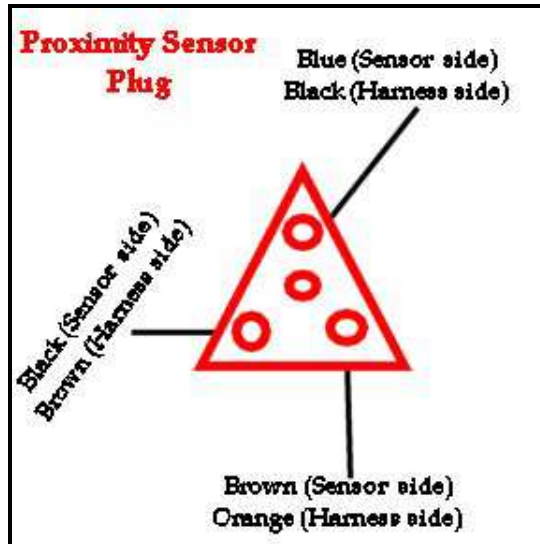
## Upgrading Your LITE System:

If you have a LITE System and have chosen to upgrade it to the regular system, there are just a few things you need to do. Unplug the Relay-Pack, and plug the computer in where the Relay-Pack was attached. Run the wire for the proximity bracket and plug it in, test it, and mount it, as described in the '**MOUNT PROXIMITY SWITCH**' section of this manual.

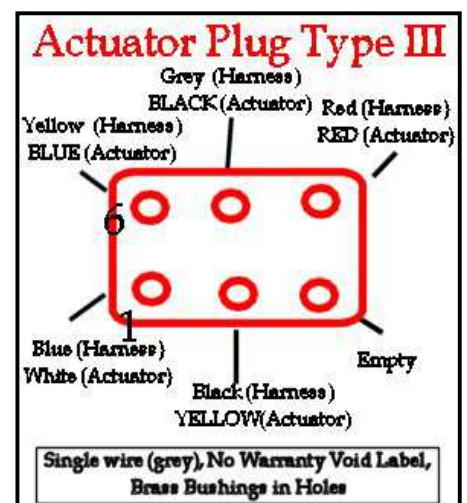
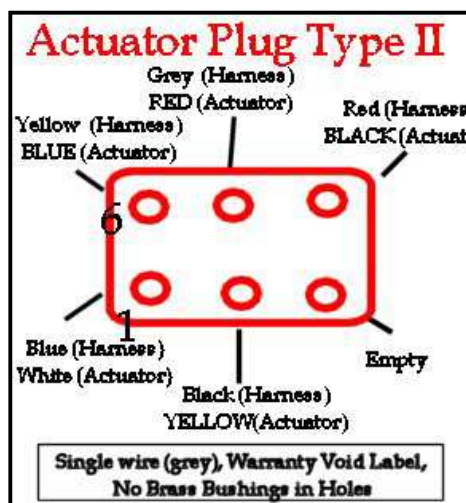
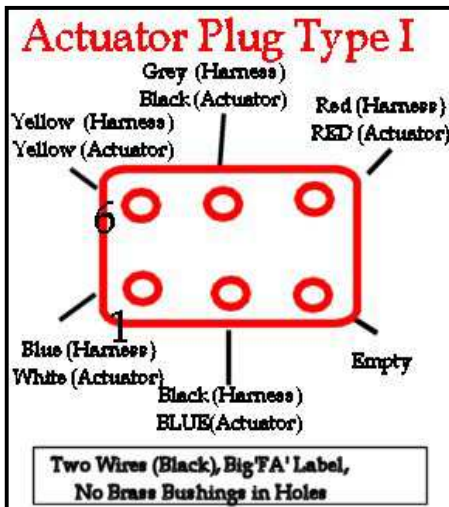
Once the new pieces are attached and plugged in, refer to '**ACTUATOR ADJUSTMENT (Maintenance Mode)**', earlier in this manual to set the lower and upper stops for the computer.

That's all it takes!

# ILLUSTRATIONS

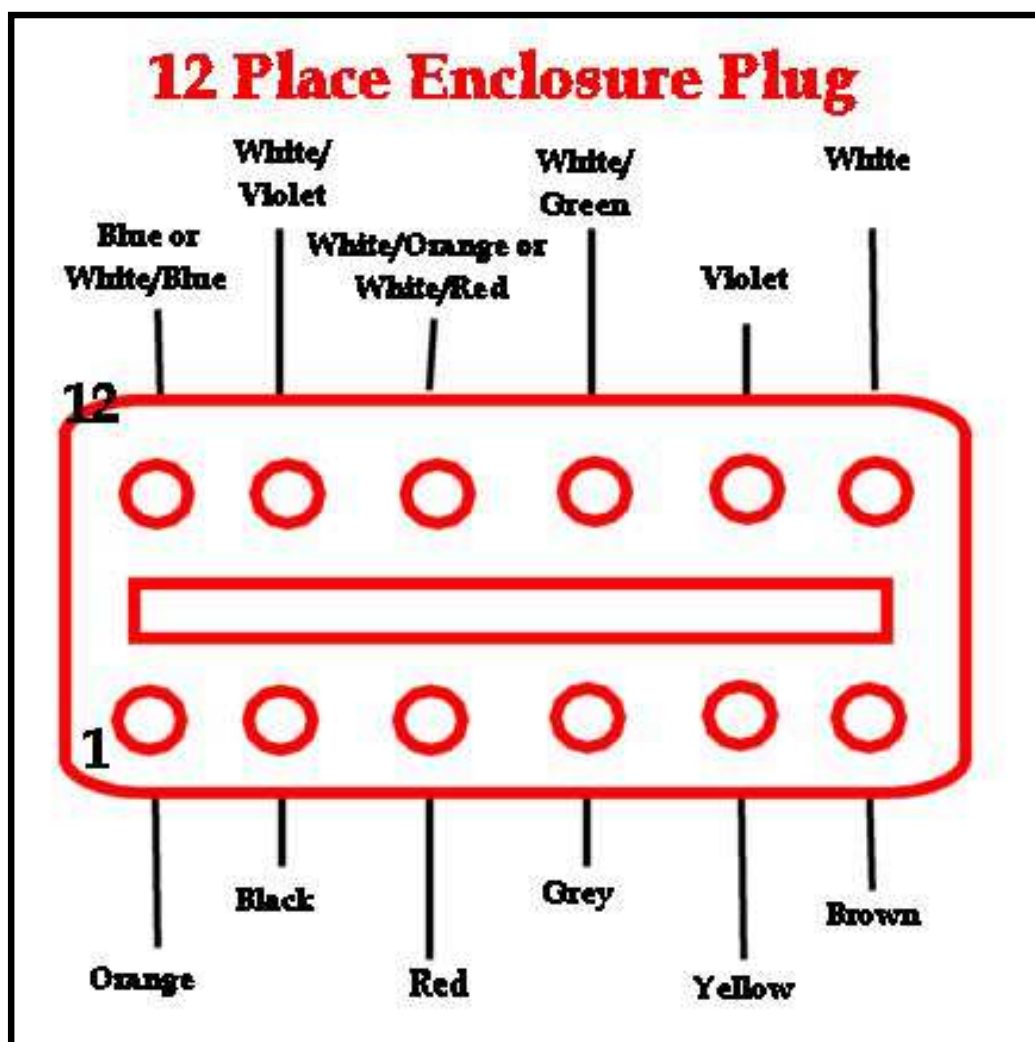


Wiring 1



There are three different types of actuators with three different wiring configurations. Refer to the notes at the bottom of the pictures above so you can match your actuator with its wiring scheme!

Wiring 2



Wiring 3

# **HARDWARE LIST**

**(2) 1/4 - 20 X 1.25" – Button Head – Chrome (Regulator – Vulcan Only)**

**(2) 1/4 - 20 – Nylock Nuts – Chrome (Regulator – Vulcan Only)**

**10-32 Allen Head Bolt cut to 1.3" (Handlebar Box)**

**#M5 – Black Allen Bolt cut to 24MM (Handlebar Mounting Bracket)**

**(1) 3/8 – 16 X 1.25" Cad Hex Bolts (Left Rear outside Upright)**

**(3) 3/8 – 16 X 1.00" Cad Hex Bolts (Left & Right Rear Uprights)**

**(4) 3/8" Cad Split Washers**

**(2) 1/4 – 20 X 3/4" Hex Bolts (Front Uprights)**

**(2) 1/4" Split Washers (Front Uprights)**

**(2) 5/16 – 18 X .75" Cad Hex Bolts (Front Upright)**

**(2) 5/16" Split Washers**

**(2) 3/8 – 16 x 2.5" Allen Head Bolts – Chrome (For Rear Upright Tops)**

**(2) 3/8 - 16 – Nylock Nuts – Chrome**

**(4) 3/8" Cad Fender Washers**

**(2) #M8 – 45 Allen Bolt - Chrome (Upper Actuator Mount – Foot Peg)**

**(1) KN-303 – Oil Filter!**